

## **7.1 Introduction**

The materials tests provide the basic materials data for structural life analyses and for residual strength calculations. For the most part, these tests are conducted as early in the design phase as practical, in order to aid in the selection of materials and in the sizing of the structure. Materials data covered by this category of tests include fracture toughness and crack growth resistance properties, as well as basic tensile, compression, bearing and shear data.

The quality control tests provide data that support the initial quality design assessments or ensure the uniformity of the production product. Requirements for these tests are defined after the preliminary sizing and the identification of fracture critical parts have been accomplished. Quality control data covered by this category of tests include equivalent initial quality (EIQ), fracture toughness, tensile strength and notch tensile strength data.

The analysis verification tests provide data that define the accuracy of the damage tolerance analysis tools relative to their ability for predicting the crack growth behavior of the structure under operational conditions. These tests are typically conducted during the design analysis and development testing phase of the contract prior to testing the full-scale structure. Additional testing may also be required subsequent to the full-scale flight and ground tests to support interpretation and evaluation of cracking problems. Analysis verification tests include those tests that are used to verify stress-intensity factor calculations, residual strength methods, crack growth calculations and test spectrum truncation procedures.

The structural hardware tests have two functions: (a) to support the verification of the complete structural design, and (b) to define those areas of the structure that need additional attention. These tests are scheduled so that there is sufficient time to incorporate structural changes into production aircraft. In fact, production go-ahead is predicated on achieving one design lifetime of flight-by-flight loading in the full-scale durability test per JSSG-2006 paragraph 3.11.1. Structural hardware tests include joint tests, component tests, assembly tests, as well as full-scale structural tests.

Each of the following sections will describe one of the four categories of damage tolerant tests. Test procedures as well as data reduction methods will be outlined as appropriate. Where the test has been required by JSSG-2006, the appropriate paragraphs in this controlling document are cited.